

THE FUNDAMENTAL LAWS OF ELECTROLYTIC CONDUCTION

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649443147

The Fundamental Laws of Electrolytic Conduction by Michael Faraday & F. Kohlrausch & Johann Wilhelm Hittorf

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

MICHAEL FARADAY & F. KOHLRAUSCH & JOHANN WILHELM HITTORF

THE FUNDAMENTAL LAWS OF ELECTROLYTIC CONDUCTION

HARPER'S SCIENTIFIC MEMOIRS

EDITED BY

J. S. AMES, Ph.D.

PROFESSOR OF PHYSICS IN JOHNS HOPKINS UNIVERSITY

VII

**THE FUNDAMENTAL LAWS
OF
ELECTROLYTIC CONDUCTION**

o

THE FUNDAMENTAL LAWS
OF
ELECTROLYTIC CONDUCTION

MEMOIRS BY FARADAY, HITTORF
AND F. KOHLRAUSCH

TRANSLATED AND EDITED

Harry Marley
BY H. M. GOODWIN, Ph.D.

ASSISTANT PROFESSOR OF PHYSICS
MASSACHUSETTS INSTITUTE OF TECHNOLOGY



34
NEW YORK AND LONDON
HARPER & BROTHERS PUBLISHERS
1899

1899, Sept. 30.
Astronomical Observatory.

HARPER'S SCIENTIFIC MEMOIRS.

EDITED BY

J. S. AMES, Ph.D.,

PROFESSOR OF PHYSICS IN JOHNS HOPKINS UNIVERSITY.

NOW READY:

THE FREE EXPANSION OF GASES. Memoirs by Gay-Lussac, Joule, and Joule and Thomson. Editor, Prof. J. S. Ames, Ph.D., Johns Hopkins University. 15 cents.

PRISMATIC AND DIFFRACTION SPECTRA. Memoirs by Joseph von Fraunhofer. Editor, Prof. J. S. Ames, Ph.D., Johns Hopkins University. 50 cents.

RÖNTGEN RAYS. Memoirs by Röntgen, Stokes, and J. J. Thomson. Editor, Prof. GEORGE F. BARKER, University of Pennsylvania. 60 cents.

THE MODERN THEORY OF SOLUTION. Memoirs by Pfeffer, Van't Hoff, Arrhenius, and Raoult. Editor, Dr. H. C. Jones, Johns Hopkins University. \$1 00.

THE LAWS OF GASES. Memoirs by Boyle and Amagat. Editor, Prof. CARL BARUS, Brown University. 15 cents.

THE SECOND LAW OF THERMODYNAMICS. Memoirs by Carnot, Clausius, and Thomson. Editor, Prof. W. F. MAGUIR, Princeton University.

THE FUNDAMENTAL LAWS OF ELECTROLYTIC CONDUCTION. Memoirs by Faraday, Hittorf, and Kohlrausch. Editor, Dr. H. M. GOODWIN, Massachusetts Institute of Technology.

IN PREPARATION:

THE EFFECTS OF A MAGNETIC FIELD ON RADIATION. Memoirs by Faraday, Kerr, and Zeeman. Editor, Dr. E. P. LAWSON, University of California.

THE WAVE-THEORY OF LIGHT. Memoirs by Huygens, Young, and Fresnel. Editor, Prof. HERSEY CURW, Northwestern University.

THE LAWS OF GRAVITATION. Editor, Prof. A. S. MACKENZIE, Bryn Mawr College.

NEW YORK AND LONDON:

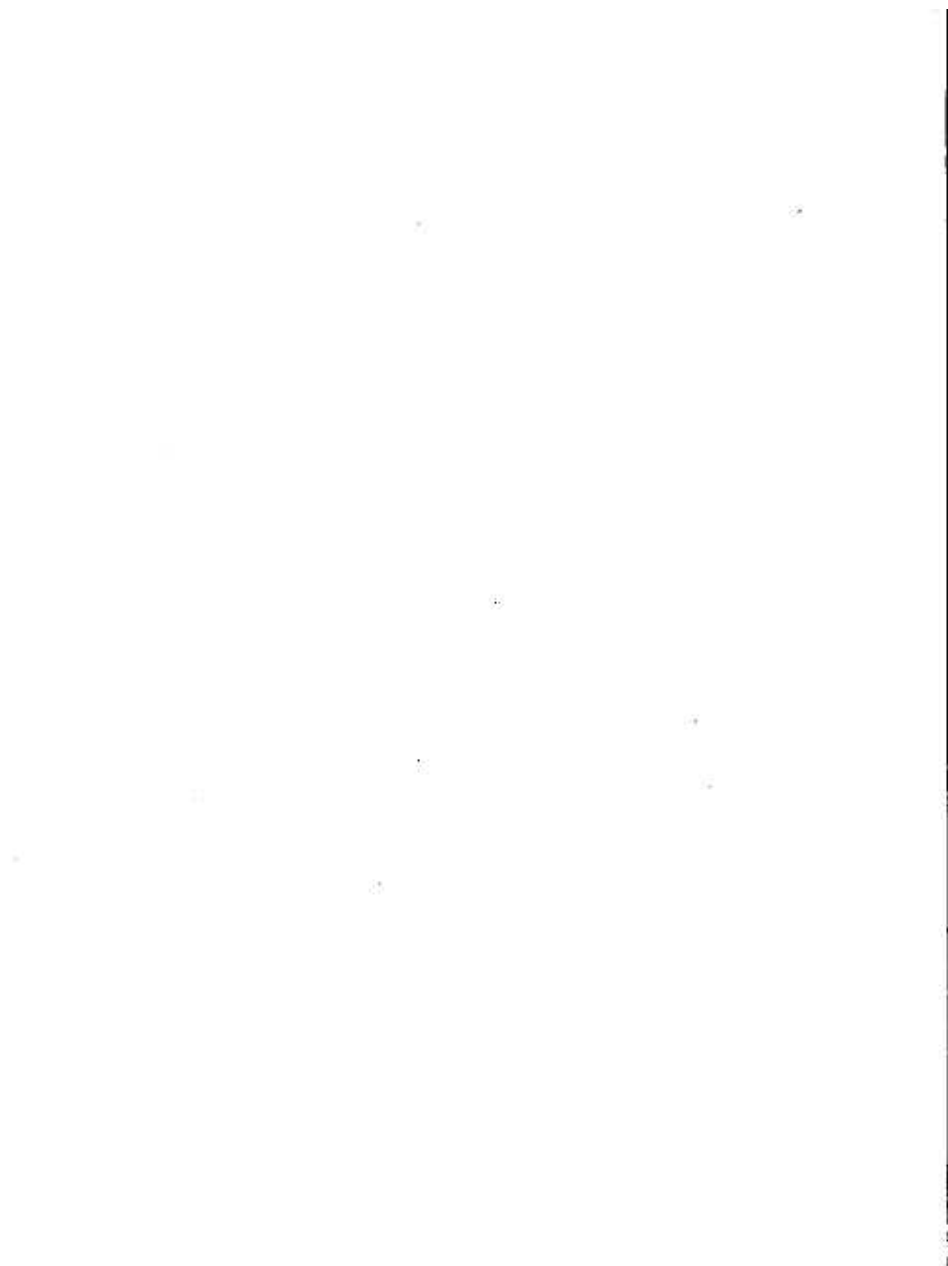
HARPER & BROTHERS, PUBLISHERS.

Copyright, 1899, by HARPER & BROTHERS.

All rights reserved.

GENERAL CONTENTS

	PAGE
Preface	v
Relation by Measure of Common and Voltaic Electricity. By Michael Faraday	3
On Electrochemical Decomposition. By Michael Faraday	11
Biographical Sketch of Faraday	44
On the Migration of Ions during Electrolysis. By W. Hittorf	49
Biographical Sketch of Hittorf	80
On the Conductivity of Electrolytes Dissolved in Water in Relation to the Migration of their Components. By F. Kohlrausch	85
Biographical Sketch of Kohlrausch	92
Bibliography	94
Index	97



PREFACE

IN the present volume are collected those papers on electrochemistry which contain the original statement of the fundamental laws and experiments on which the modern theory of electrolytic conduction is based. Of these, Faraday's law of definite electrochemical action and electrochemical equivalents, first stated in 1834, naturally takes precedence. This law is universally recognized as one of the few rigidly exact laws of nature, and lies at the basis of all electrochemical theory and practice. Of the extended series of experiments in electrochemistry, contained in the fifth and seventh series of Faraday's *Experimental Researches*, all of which touch more or less on the law in question, only those sections which have a direct bearing on the establishment of the law are here presented. Faraday's brief paper on the "Relation by Measure of Common and Voltaic Electricity" has been added as an introduction, as it was in this article that he was first led to a statement of the probable existence of the law to which he afterwards devoted so much attention.

Second only to Faraday's law, the classical researches of Hittorf on the concentration changes produced at the electrodes during electrolysis, have proved of fundamental significance in the explanation of electrolytic phenomena. The explanation given by Hittorf in 1853 of this phenomenon is still that generally accepted by physicists at the present time. Of Hittorf's five papers bearing on this subject, all of which are easily accessible in German in Ostwald's *Klassiker der Exakten Wissenschaften*, the first only has been here translated. This, however, is complete in itself, and contains not only a statement of Hittorf's theory, but also a comprehensive and remarkably careful experimental investigation of the phenomenon of transference. The later papers are mainly an exten-

PREFACE

sion of the first, with applications to certain important problems of chemical constitution.

The great importance of the results obtained by Hittorf was not generally recognized at the time of their publication, but only after F. Kohlrausch had pointed out their bearing on his investigations on the electrical conductivity of solutions. The elegance of method and accuracy with which these investigations have been, and are still being carried out, place them pre-eminent among investigations of this class. Immediately after sufficient conductivity data had been obtained, Kohlrausch recognized the bearing of Hittorf's investigations upon his results, and was led to the formulation of the law of the independent migration of ions. The paper in which this law was first presented to the Göttingen Academy in 1876 is translated in full. It was not until 1879 that the researches, of which this was the most important conclusion, appeared in complete form in Wiedemann's *Annalen*.

With the establishment of the laws of Faraday, Hittorf, and Kohlrausch the way was prepared for the dissociation theory of Arrhenius, which was announced in 1886, as soon as the theory of solutions had been formulated by Van't Hoff.

H. M. GOODWIN.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.